SUBJ: AIR TRAFFIC OPERATIONAL REQUIREMENTS
FOR TOWER AUTOMATION SYSTEMS

1.   PURPOSE. This order sets forth the operational requirements for airport traffic control tower (ATCT) automation systems.

2.   DISTRIBUTION. This order is distributed at the branch level in Air Traffic, Systems Maintenance Service, NAS System Engineering Service, Operational Support Service, and Research and Development Service in Washington and Air Traffic and Airway Facilities Divisions at regional headquarters.

3.   BACKGROUND. The implementation of different automation systems in ATCT's has resulted in a wide proliferation of equipment with various Computer-Human Interfaces (CHI) and multiple levels of automation capability. Replacement of these individual systems with a standard automation system with a common CHI will reduce multiple and individual systems hardware, provide capacity for air traffic growth, accommodate user demands, reduce controller workload, and increase productivity, thereby increasing capacity in the National Airspace System.

4.   DEFINITION. The ATCT automation system is a dynamic system which gathers, consolidates, integrates, and disseminates information from a variety of sources (e.g., radars, navigational aids, flight data, and weather data) to assist the tower controller.

5.   SYSTEM LEVEL CRITERIA. The level of automation system provided to a control tower is based on the level of air traffic activity at the associated airport. Three levels of automation systems are defined to support ATCT operational requirements. The levels of systems provided are calculated using the number and type of airport operations. The calculation employs a weighted formula in accordance with FAA-APO-83-2, Establishment and Discontinuance Criteria for Airport Traffic Control Towers, Chapter IIB, Phase 1 Criteria. This formula has been superseded by an economic cost versus benefit analysis but remains an appropriate tool for establishing an automation qualification standard for control towers. Refer to Appendix 1, Phase 1 Criteria.

a.   Level 1. System availability not less than 0.999 (resulting in system unavailability of less than 9 hours per year) and connectivity to the automation system at one (1) parent facility (i.e., an air traffic control facility with an Advanced Automation System Area Control Computer Complex). ATCT's qualify for this level with a tower calculated value of less than one (1).

b.   Level 2. System availability not less than 0.999 (resulting in system unavailability of less than 9 hours per year) and independent connectivity to the automation system at two (2) parent facilities. ATCT's qualify for this level with a tower calculated value equal to or greater than one (1) and equal to or less than two (2).

c.   Level 3. System availability not less than 0.99995 (resulting in system unavailability of less than 27 minutes per year) and independent connectivity to the automation system at two parent facilities. ATCT's qualify for this level with a tower calculated value of greater than two (2).

6.   GENERAL SYSTEM REQUIREMENTS. Tower automation systems shall support the following general operational system requirements:

a.   The CHI shall be common in all levels of tower automation systems.

b.   The addition of tower automation systems shall not increase the current workload of the controller.

c.   Displayed information shall be readable under all light conditions. Display brightness and contrast shall be controllable with sufficient granularity to approximate continuous adjustment for use in changing environments.

d.   The system shall support the primary operational needs of the local and ground controllers to focus their attention "out the window" and to move freely about the tower cab while utilizing the tower automation system.

e.   The system shall be modular in design to accommodate the different types (or multiples of the same type) of positions and required interfaces. The system design shall accommodate up to:

(1)   Six (6) positions for Level 1
(2)   Nine (9) positions for Level 2
(3)   Eighteen (18) positions for Level 3

     f.   Operational positions shall be system definable and support the combining and interchange of operational positions.

     g.   System design shall accommodate growth requirements as follows:

     (1)   Equipment and functional designs shall be modular to support the addition of new functions.

     (2)   Be extensible to support new or additional interfaces.

     (3)   Provide 25 percent system reserve in computer processor and memory capacity for the anticipated system life-cycle demand.

     h.   The system shall support the transition to future automation systems without requiring additional personnel or degrading operational services.

     i.   The tower automation system shall provide full-service operation during power fluctuations. Following a complete power failure, the system shall be capable of full operation without having to reconstitute the entire data base (e.g. critical data recording) within 1 minute after power is restored.

     j.   The tower automation system and all information within the system shall be secure from unauthorized access. Retrieval of information from the system shall be provided without impacting operational usability.

     k.   Data recording and archival requirements.

     (1)   The tower automation system shall have the capability of recording all information including the nature, content, clock time, and date of said information.

     (2)   Automatic and archiving capability shall be provided for maintaining the information identified above and other information that may be appropriate for facility record keeping. The capability for a forced archive shall also be provided.

     (3)   All archived data shall be maintained in true ASCII format and readily transferable from the archive storage medium to floppy disc operating system (DOS) format.

7.   RADAR SURVEILLANCE DISPLAYS. The radar functional requirements for ATCT's which have radar surveillance coverage, either by Airport Surveillance Radar (ASR) or Air Route Surveillance Radar (ARSR), over one or more of the standard instrument final approach fixes, are as follows:

    a.   Radar functionality shall be provided to support all applicable air traffic separation minima.

    b.   The tower automation system shall be capable of displaying primary and secondary aircraft targets with alphanumeric data blocks within a minimum radius of 20 nautical miles from the center of the associated airport.

    c.   The display equipment shall have the capability of providing variable range settings. Range marks and off-centering to any point on the display shall be available at any range setting.

    d.   The tower automation system shall provide the capability to select filtering of Mode C Intruder targets and alphanumeric data blocks by altitude and beacon code for each display.

    e.   The presentation on each physical display shall be capable of independent selection without affecting other displays or system response time. The information on the display shall be readily discernible by the controller at distances from 16 inches to 8 feet.

    f.   The capability of selection and display of geographic maps shall be by site-specific parameters; i.e., number, type, and format. The selection and display capabilities shall also include, as a minimum, the video map data requirements contained in the current edition of Order 7210.3, Facility Operation and Administration.

    g.   Weather data shall be integrated onto the surveillance display. The tower automation system shall be capable of simultaneously displaying, at the controller's option, the levels of precipitation intensity available from the radar sensor(s).

    h.   The system design shall provide for safety alert capability as follows:

        (1) Conflict Alerts shall be generated for existing or pending situations between controlled aircraft and controlled/ uncontrolled transponder equipped aircraft that require immediate attention or action. Warnings shall be presented both on the surveillance display and an aural alarm.

(2)   Minimum Safe Altitude Warnings shall be generated with respect to defined general terrain and airport approach paths. Warnings shall be presented both on the surveillance display and an aural alarm.

(3)   Controlled Area Intrusion Warnings shall be generated for noncontrolled, Mode C equipped aircraft which enter airport traffic areas, airport radar surveillance areas, or terminal control areas. Warnings shall be presented both on the surveillance display and an aural alarm.
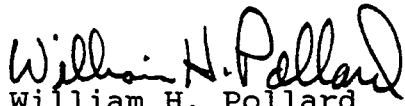
8.   <u>FLIGHT DATA</u>. Flight plan information on active and proposed flights shall be provided to ATCT's as follows:

a.   All operational positions shall be provided flight data per national Air Traffic directives.

b.   Arrival and departure flight data and general information messages shall be received by the tower automation system from the parent facility and be available at all operational positions.

c.   The tower automation system shall be capable of exchanging all pertinent data with parent facilities.

9.   <u>AIRPORT INFORMATION</u>. The tower automation system shall be capable of exchanging airport environmental information with the parent facilities. The system shall also provide the necessary interfaces to receive and/or send operational and environmental data to airport users and to other select airport locations.

William H. Pollard
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APPENDIX 1.   PHASE 1 CRITERIA

This appendix lists the methodology for computing the calculated value for establishment of ATCT automation systems. The formula is as follows:

$$\frac{AC}{38,000} + \frac{AT}{90,000} + \frac{GAI}{160,000} + \frac{GAL}{280,000} + \frac{MI}{48,000} + \frac{ML}{90,000} = \text{Calculated Value}$$

Where:

AC	=	Air Carrier Operations
AT	=	Air Taxi Operations
GAI	=	General Aviation Itinerant Operations
MI	=	Military Itinerant Operations
GAL	=	General Aviation Local Operations
ML	=	Military Local Operations